



**SLOVENSKI STANDARD**  
**SIST-TP CLC/TR 50659:2017**

**01-maj-2017**

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**Elektromagnetne karakteristike linearnega sistema za urejanje okablenja (CMS)**

Electromagnetic characteristics of linear cable management systems (CMS)

Rapport Technique - Caractéristiques électromagnétiques des systèmes linéaires de câblage

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**Ta slovenski standard je istoveten z: CLC/TR 50659:2017**

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**ICS:**

29.120.10	Inštalacijske cevi za električne namene	Conduits for electrical purposes
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TECHNICAL REPORT  
RAPPORT TECHNIQUE  
TECHNISCHER BERICHT

**CLC/TR 50659**

March 2017

ICS 29.120.10

English Version

## Electromagnetic characteristics of linear cable management systems (CMS)

Rapport Technique - Caractéristiques électromagnétiques  
des systèmes linéaires de câblage

Elektromagnetische Eigenschaften von linearen  
Kabelführungssystemen

This Technical Report was approved by CENELEC on 2017-03-06.

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique  
Europäisches Komitee für Elektrotechnische Normung

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## European foreword

This document (CLC/TR 50659:2017) has been prepared by CLC/TC 213, "Cable management systems".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

This Technical Report provides test methods for the measurement of electromagnetic characteristics of linear Cable Management Systems (CMS).

This is a European Technical Report for cable management products used for electro-technical purposes. It relates to the Council Directives on the approximation of laws, regulations and administrative provisions of the Member States relating to Low Voltage Directive 2014/35/EU through consideration of the essential requirements of this Directive.

This European Technical Report is supported by separate standards to which references are made.

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## CLC/TR 50659:2017 (E)

## 1 Scope

This Technical Report provides test methods for the measurement of the following electromagnetic characteristics of lengthwise cable management systems like conduit systems according to EN 61386 series, cable trunking systems and cable ducting systems (CTS/CDS) according to EN 50085 series and cable tray and cable ladder systems according to EN 61537:

- shielding effectiveness of magnetic field,
- transfer impedance.

This Technical Report also provides guidance on how these characteristics can be declared and may be used.

Powertrack systems covered by EN 61534 series are not covered by this edition of the Technical Report and may be considered in a new edition.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 61000-4-5, *Electromagnetic Compatibility (EMC) — Part 4-5: Testing and measurement techniques — Surge immunity test (IEC 61000-4-5)*

EN 61000-5-7, *Electromagnetic compatibility (EMC) - Part 5-7: Installation and mitigation guidelines - Degrees of protection by enclosures against electromagnetic disturbances (EM code)*

## 3 Terms and definitions (standards.iteh.ai)

For the purposes of this document, the following terms and definitions apply.

**3.1** <https://standards.iteh.ai/catalog/standards/sist/261452d1-9306-415d-afb0-78e77360347e/sist-tp-clc-tr-50659-2017>  
**shielding effectiveness**

**SE**

ability of a cable management system to attenuate an electromagnetic signal as it enters or exits the CMS, quantified as the ratio of a signal received (from a transmitter) without the shield, to the signal received with the shield in place

### 3.2

**magnetic field**

constituent of an electromagnetic field which is characterized by the magnetic field strength H together with the magnetic flux density B

Note 1 to entry: In French, the term “champ magnétique” is also used for the quantity magnetic field strength.

[SOURCE: IEC 121-11-69]

### 3.3

**signal to noise ratio**

**SNR**

ratio in dB between the measured peak current  $I_{1,\max}$  in the current loop when the current probe is connected to the current loop and the measured peak current  $I_{N,\max}$  when the current probe is not connected to the current loop but in a narrow position of the current loop. Both peak currents measured at the same excitation current in the excitation winding

$$SNR (dB) = 20 \times \log \left( \frac{I_{1,\max}}{I_{N,\max}} \right)$$

Note 1 to entry:  $I_{1,\max}$  and  $I_{N,\max}$  show their maxima at different time.

**3.4****electromagnetic shielding coding**

coding system to indicate the degree of protection provided by a CMS against the passage of electromagnetic energy

**3.5****CMS transfer impedance** **$Z_{CMS}$** 

ratio of a voltage drop, between two specified points, caused by a disturbing current flowing through the cable management system and the disturbing current

This voltage drop is a combination of

- the voltage drop along this cable management system due to the current flowing through this cable management system and
- the voltage drop along a conductor contained in this cable management system due to the magnetic field arising from the current flowing through this cable management system.

**3.6****virtual CMS transfer impedance** **$Z_{v CMS}$** 

CMS transfer impedance defined by the ratio of the maximum asymmetrical mode voltage and the maximum disturbing current during a time domain pulse

**3.7****common mode voltage (or asymmetrical voltage  $V_{As}$ )**

mean of the phasor voltages appearing between each conductor and a specified reference, usually earth or frame

[SOURCE: IEC 161-04-09, modified]

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**3.8****shielded enclosure (or screened room)**

mesh or sheet metallic housing designed expressly for the purpose of separating electromagnetically the internal and the external environment

[SOURCE: IEC 161-04-37]

**4 Shielding effectiveness of magnetic field****4.1 Introduction**

This Technical Report defines the test method for the determination of shielding effectiveness of magnetic field (SE) for lengthwise cable management systems (CMS).

The efficiency of a shielding is quantified by its shielding effectiveness (SE). The shielding effectiveness (SE) in this Technical Report is only intended for magnetic fields.

As an activating source a 8/20  $\mu$ s impulses current shall be used.

The electrical field shielding effectiveness (SE) of metallic cable management systems is not covered by this Technical Report.

While a screen is a technical provision, the shielding effectiveness shows the performance of this screen with regard to Electromagnetic Compatibility (EMC) and Electromagnetic Interference (EMI).

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## 4.2 Declaration

## 4.2.1 General

The shielding effectiveness of magnetic field shall be declared using the electromagnetic shielding coding described in 4.2.2 and the additional rules described in 4.2.3.

## 4.2.2 Electromagnetic shielding coding

The electromagnetic shielding coding consists of “EM” followed by five positions according to Table 1.

Table 1 — Electromagnetic shielding coding

CMS Type	EM	First position	Second position	Third position	Fourth position	Fifth position
Cable tray and cable ladder systems	EM	A letter representing the frequency band as shown in Table 2	A number being the test result for CMS with cover running in a plane parallel to the plane of the excitation winding (Figure 2a)	A number being the test result for CMS without cover running in a plane parallel to the plane of the excitation winding (Figure 2b)	A number being the test result for CMS with cover running in a plane perpendicular to the plane of the excitation winding (Figure 2c)	A number being the test result for CMS without cover running in a plane perpendicular to the plane of the excitation winding (Figure 2d)
Cable trunking systems	EM	A letter representing the frequency band as shown in Table 2	A number being the test result for CMS with cover running in a plane parallel to the plane of the excitation winding (Figure 2a)	NA	A number being the test result for CMS with cover running in a plane perpendicular to the plane of the excitation winding (Figure 2c)	NA
Cable ducting systems	EM	A letter representing the frequency band as shown in Table 2	A number being the test result for CMS with the larger dimension running in a plane parallel to the plane of the excitation winding (Figure 2a)	NA	A number being the test result for CMS with the larger dimension running in a plane perpendicular to the plane of the excitation winding (Figure 2c)	NA
Conduit systems	EM	A letter representing the frequency band as shown in Table 2	A number being the test result for CMS running in the plane of the excitation winding (Figure 2a)	NA	A number being the test result for CMS running in the plane of the excitation winding (Figure 2c)	NA

NOTE “NA” means “not applicable”.

Table 2 — Frequency band code

Frequency band	Frequency band code
10 kHz - 100 kHz	A
100 kHz - 1 MHz	B

The test method currently using 8/20  $\mu$ s impulses current included in this Technical Report only allows declaration for frequency band 10 kHz – 100 kHz (Frequency band code A).



### 4.2.3 Additional rules

The declared shielding effectiveness shall be the measured shielding effectiveness in dB rounded to the closest integer, always using two digits.

Examples: 17,49 dB will be 17 and 17,5 dB will be 18. 9,2 dB will be 09.

When shielding effectiveness can be declared, "XX" means not declared.

### 4.2.4 Example of declaration

Declaring for a cable tray system "EM A-37-20-09-XX" for shielding effectiveness of magnetic field means, for a frequency band of 10 kHz - 100 kHz,

- a shielding effectiveness of 37 dB for CMS with cover running in a plane parallel to the plane of the excitation winding
- a shielding effectiveness of 20 dB for CMS without cover running in a plane parallel to the plane of the excitation winding
- a shielding effectiveness of 9 dB for CMS with cover running in a plane perpendicular to the plane of the excitation winding
- a shielding effectiveness not declared for CMS without cover running in a plane perpendicular to the plane of the excitation winding

Declaring for a cable trunking system "EM A-37-NA-09-NA" for shielding effectiveness of magnetic field means, for a frequency band of 10 kHz - 100 kHz,

- a shielding effectiveness of 37 dB for CMS with cover running in a plane parallel to the plane of the excitation winding
- a shielding effectiveness of 9 dB for CMS with cover running in a plane perpendicular to the plane of the excitation winding

Declaring for a conduit system "EM A-70-NA-70-NA" for shielding effectiveness of magnetic field means, for a frequency band of 10 kHz - 100 kHz,

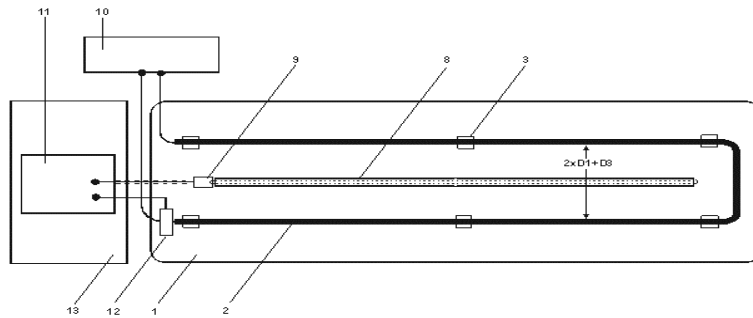
- a shielding effectiveness of 70 dB for CMS running in the plane of the excitation winding.

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### 4.3 Test arrangement

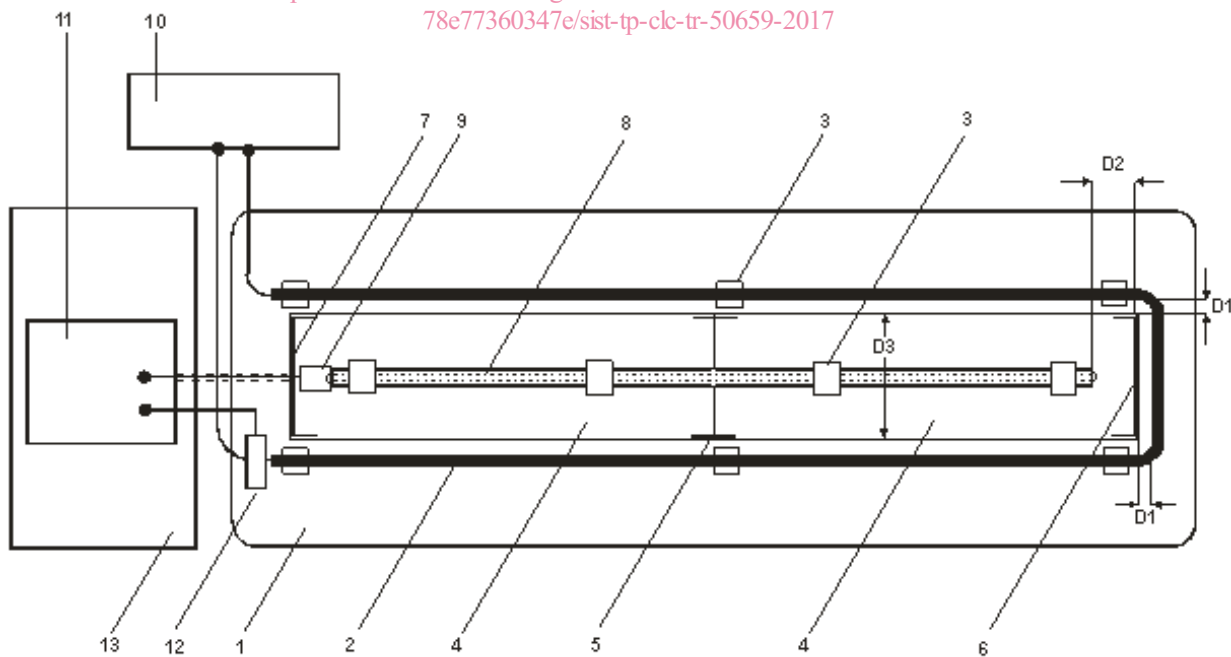
#### 4.3.1 General

The test arrangement is shown in Figures 1a to 1c.



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**Figure 1a — Test arrangement without CMS**  
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**Figure 1b — Test arrangement for CMS without cover**

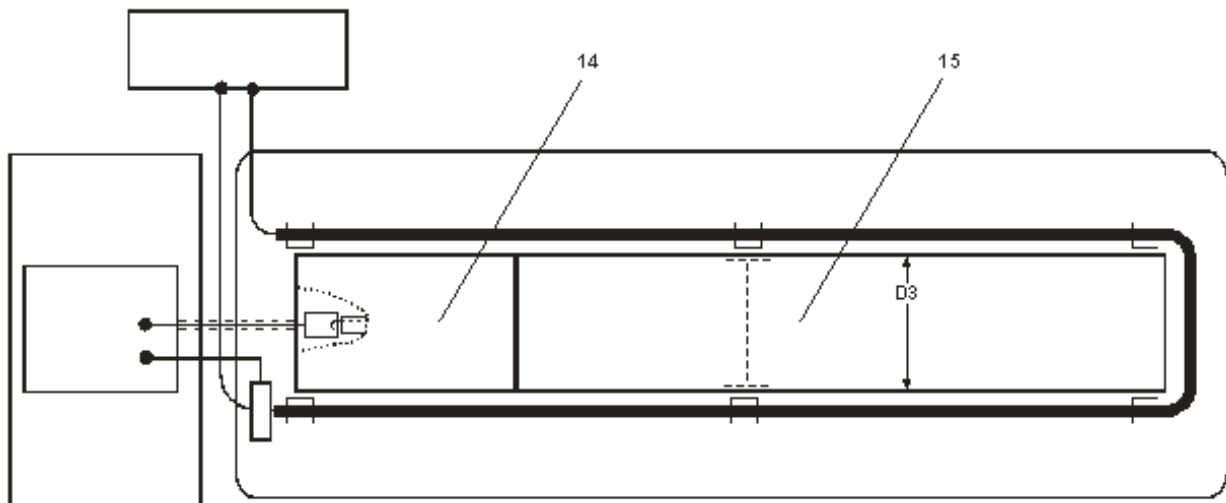


Figure 1c — Test arrangement for CMS with cover

**Key**

- 1 table without any conductive part
- 2 excitation winding
- 3 plastic fixings
- 4 samples each (1000 ± 3) mm
- 5 junction
- 6 terminating fitting
- 7 terminating fitting with central opening of up to approximately 50 mm x 50 mm
- 8 current loop
- 9 current probe
- 10 surge current generator
- 11 oscilloscope
- 12 current probe excitation winding
- 13 shielding cabinet
- 14 cover (500 ± 3) mm
- 15 cover (1500 ± 3) mm
- D1 gap between excitation winding and sample (30 ± 3) mm
- D2 gap between current loop and terminating fitting if any or extremity of the sample (150 ± 5) mm on both sides
- D3 width of the sample measured in the plane of the excitation winding

Figure 1 — Test arrangement for the measurement of shielding effectiveness of magnetic field

The excitation winding shall be spaced at least 800 mm from any conductive part in any direction except on the feeding side.

**4.3.2 Table**

The test arrangement shall be placed on a table made of non conductive material (example: wood). The table shall be sufficiently stable to carry safely all the components before and while testing. To avoid measurement errors, the table shall not have any conductive part and its height shall be at least 800 mm.